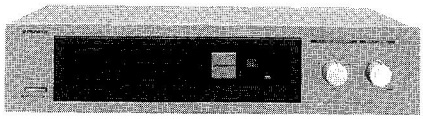
PIONEER®

Service Manual

CIRCUIT DESCRIPTIONS
REPAIR & ADJUSTMENTS



ORDER NO.
ARP-446-0

RG DYNAMIC PROCESSOR

RG-60

MODEL RG-60 COMES IN SIX VERSIONS DISTINGUISHED AS FOLLOWS:

Type	Voltage	Remarks
KU	AC 120V only	U. S. A. model
KC	AC 120V only	Canada model
HEM	AC 220V, 240V (switchable)	European continent model
HB	AC 220V, 240V (switchable)	United Kingdom model
S	AC 110V, 120V, 220V, 240V (switchable)	General export model
S/G	AC 110V, 120V, 220V, 240V (switchable)	U. S. Military model

- **This service manual is applicable to the S and S/G types. For servicing of the other types, please refer to the additional service manual.**

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PIONEER ELECTRONIC [EUROPE] N.V. Keetberglaan 1, 2740 Beveren, Belgium
PIONEER ELECTRONICS AUSTRALIA PTY. LTD. 178-184 Boundary Road, Braeside, Victoria 3195, Australia

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1. SPECIFICATIONS

Processor Section

Maximum Output Voltage 6.5V
(1kHz, T.H.D.: 0.5% R_L: 50kΩ, DYNAMIC EXPANSION: 16dB)

Total Harmonic Distortion 0.05%
(Output: 1V, 1kHz, DYNAMIC EXPANSION: 16dB)

Dynamic Expansion Gain 4, 7, 10, 13 16dB

DYNAMIC EXPANSION	4dB	7dB	10dB	13dB	16dB
Upward Gain	+2dB	+4dB	+6dB	+8dB	+10dB
Downward Gain	−2dB	−3dB	−4dB	−5dB	−6dB

Impulse Response
Attack Time 0.3msec
Release Time 120msec

Input Impedance 50kΩ

Output Impedance 220Ω

Signal to Noise Ratio (IHF A, Short-circuited, DYNAMIC EXPANSION: 16dB) . . . . . 100dB (at 1V)
116dB (at 6.5V)
106dB (at 2V)

Miscellaneous

Power Requirements
KY, KC models . . . . . AC 120 Volts, 60 Hz
S, S/G models . . . . . ~AC 110V/120V/220V/240V (switchable), 50/60 Hz
HB model . . . . . a.c. 240 Volts ~ 50/60 Hz
YP model . . . . . a.c. 240 Volts ~ 50 Hz

Power Consumption . . . . . 10 Watts (max.)

Dimensions . . . . . 420(W) x 99(H) x 340(D) mm
16-9/19(W) x 3-7/8(H) x 13-3/8(D) in.

Weight . . . . . 4.5 kg (9 lb 15 oz)

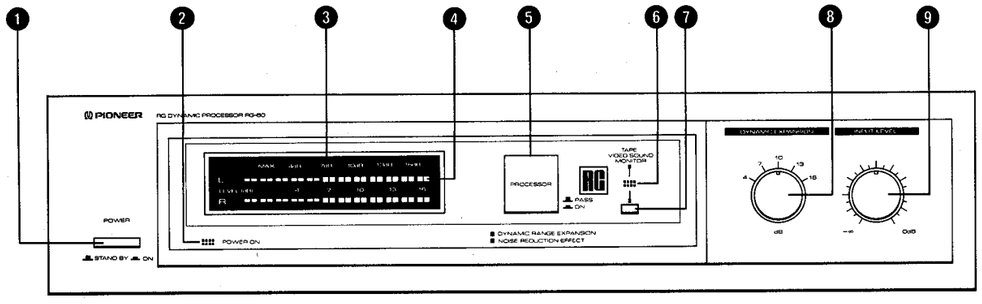
Accessories

Pin-plug connecting cords 2

Operating Instructions 1

NOTE:
Specifications and design subject to possible modification without notice, due to improvements.

2. FRONT PANEL FACILITIES



❶ POWER SWITCH (POWER)

When this switch is set to the ON position, power is supplied to the unit's main circuits. The unit's power switch is geared to selecting the transformer's secondary and so even at the STAND-BY position, the unit's circuitry will work as long as the power cord is connected to the power outlet.

Disconnect the power cord from the power outlet when you do not plan to use the unit for a long period of time.

❷ POWER INDICATOR

This comes on as soon as the RG-60's power switch is set to ON to indicate that power is being supplied.

❸ DYNAMIC EXPANSION METER

This meter allows you to read out the gain boost with respect to the input signal in decibels.

❹ DYNAMIC EXPANSION INDICATORS

The 4dB, 7dB, 10dB, 13dB, 16dB indicators light up in accordance with the position of the dynamic expansion selector.

❺ PROCESSOR SWITCH

Depress this switch (ON) to produce an expansion effect with the signals fed from the PROCESSOR INPUT jacks. The dynamic expansion indicator will come on, and signals featuring an expansion effect only will be fed out from the model RG-60's OUTPUT jacks. In the PASS position, the RG-60 circuitry is bypassed. This position allows for instant comparison between the expanded and the unprocessed signals.

NOTE:
When the RG-60's power switch is set to the STAND-BY position and the processor switch is also set to PASS, the signal which has bypassed the processor circuitry is made available at the OUTPUT jacks. There will, however, be no output if the input level control is set to the '−∞' position. Make sure that this control is set to the '0dB' position.

❻ TAPE/VIDEO SOUND MONITOR INDICATOR

This comes on when the tape/video sound monitor switch is depressed.

❼ TAPE/VIDEO SOUND MONITOR SWITCH

Depress this switch to monitor the sound on the tape as it is being recorded or when playing back a tape using a tape deck connected to the RG-60's TAPE/VIDEO SOUND jacks. (The tape monitor indicator comes on.) Set the switch to OFF when not in use.

❽ DYNAMIC EXPANSION SELECTOR

This selector selects maximum gain boost value with respect to the input level, i.e.: ratio of gain increase between large input signal and small input signal. Maximum gain boost increases as the selector is turned clockwise. Set the selector to the most desirable position while listening to the reproduced sound.

** Dynamic Expansion*
Dynamic expansion is defined as the sum of the downward expansion (where small inputs are expanded down) and upward expansion (where large inputs are expanded up).

❾ INPUT LEVEL CONTROL

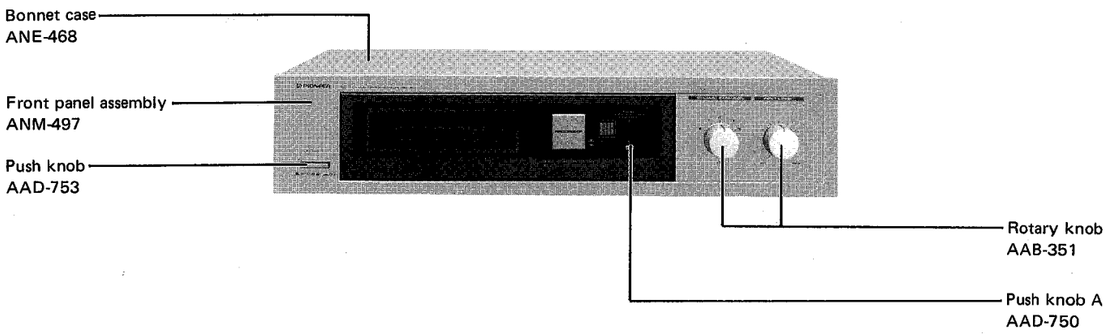
Use this control to adjust the input level at which the expansion effect is initiated. Clockwise rotation increases the expansion with respect to small signal levels (increases expansion sensitivity). Adjust the control for desired effect according to program source.

3. PARTS LOCATION

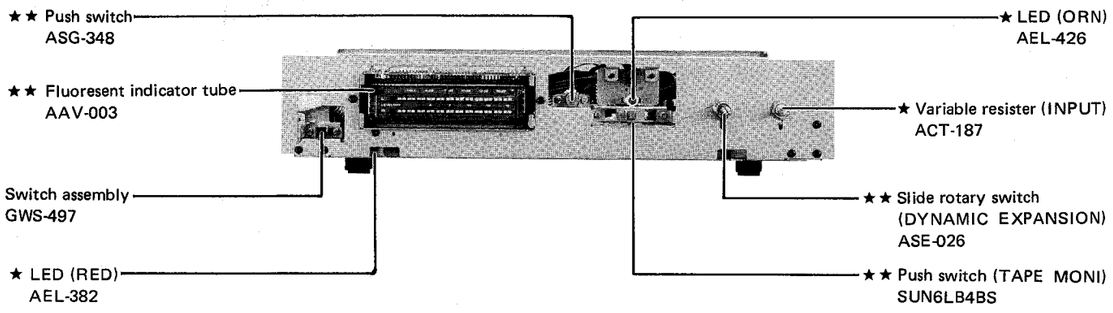
NOTES:

- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

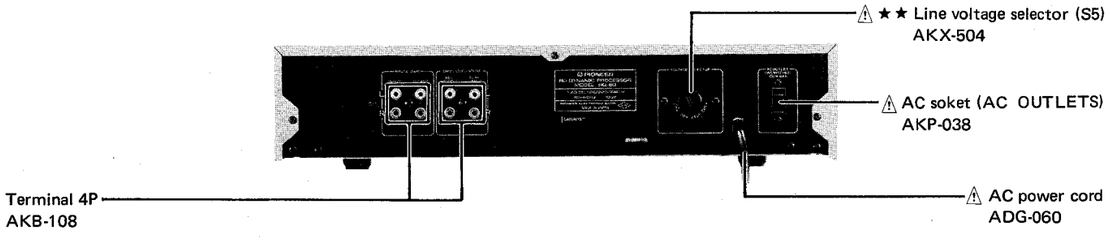
Front Panel View



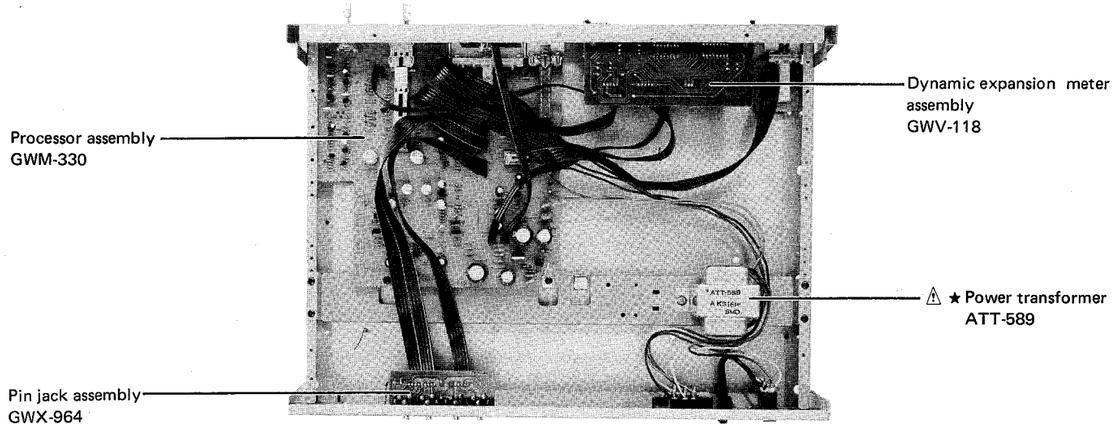
Front View with Panel Removed



Rear Panel View



Top View



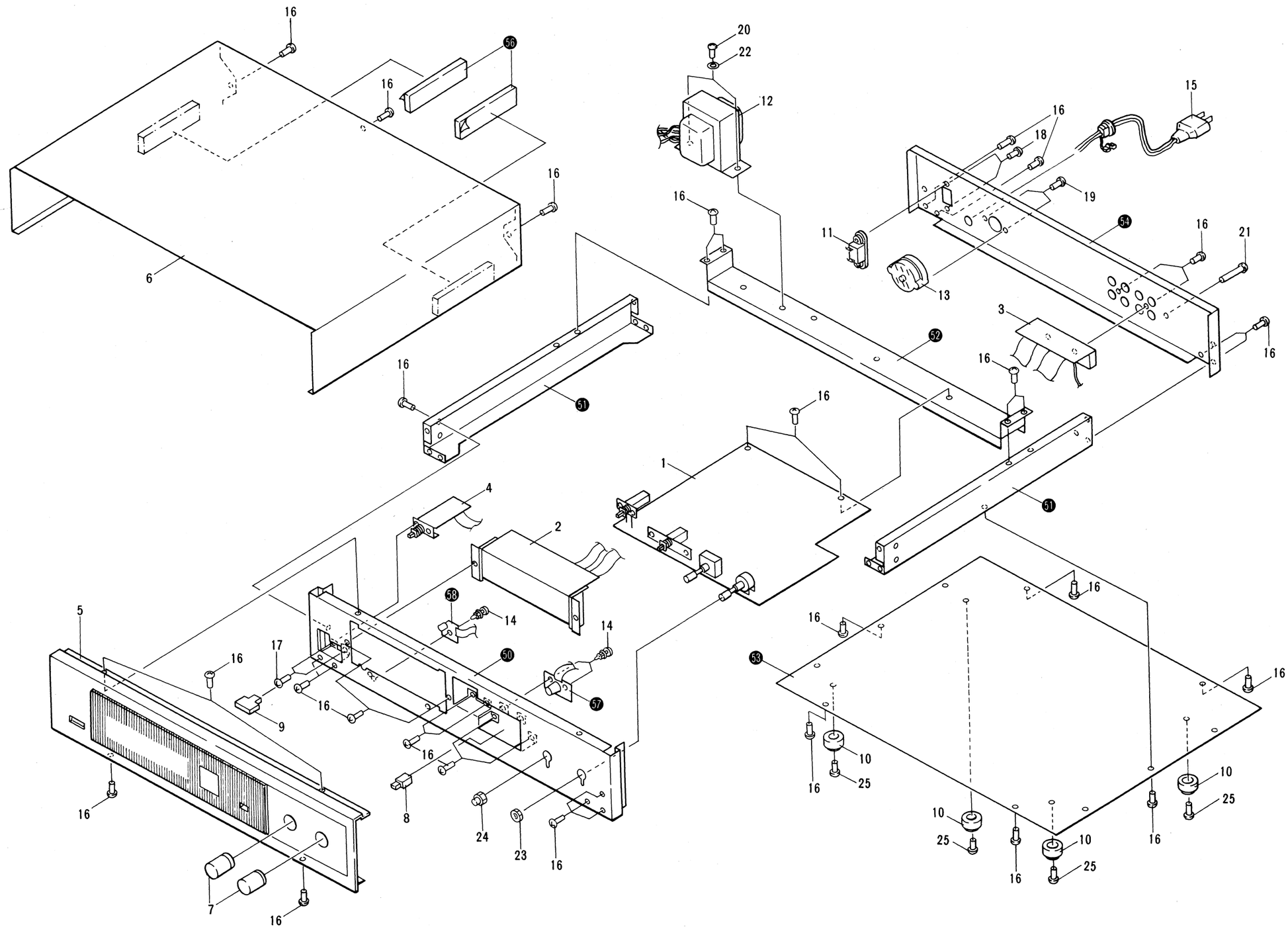
4. EXPLODED VIEW

NOTES:

- *Parts without part number cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

Parts List

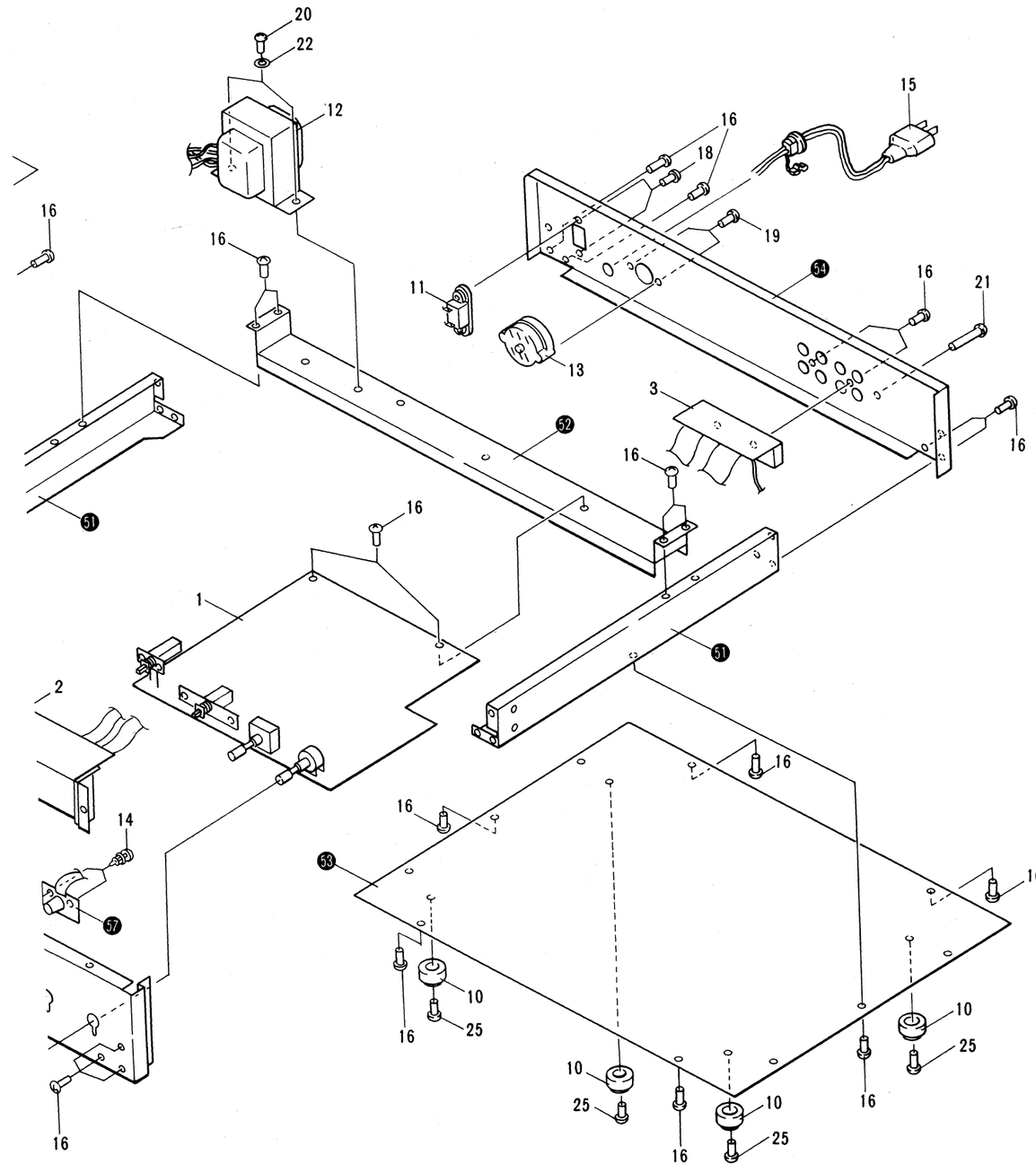
Mark	No.	Part No.	Description	Mark	No.	Part No.	Description
	1.	GWM-330	Processor assembly		20.	VTZ40P080FMC	Screw 4 x 8
	2.	GWV-118	Dynamic expansion meter assembly		21.	ABA-176	Tapping screw
					22.	WA45F125K050	
	3.	GWX-964	Pin jack assembly		23.	NK90FZB	
	4.	GWS-497	Switch assembly		24.	ABN-082	Guide boss
	5.	ANM-497	Front panel assembly		25.	VTZ40P160FMC	Screw 4 x 16
	6.	ANE-468	Bonnet case		50.		Panel stay
	7.	AAB-351	Rotary knob		51.		Side stay
	8.	AAD-750	Push knob A		52.		Center frame
	9.	AAD-753	Push knob		53.		Bottom plate
	10.	AEC-351	Leg assembly		54.		Rear panel
⚠	11.	AKP-038	AC soket (AC OUTLETS)		55.		Cushion rubber
⚠ ★	12.	ATT-589	Power transformer		56.		Tape monitor LED assy
⚠ ★★	13.	AKX-504	Line voltage selector (S5)		57.		Power LED assembly
	14.	AEC-525	Nylon rivet				
⚠	15.	ADG-060	AC power cord				
	16.	BCZ30P060FZK	Screw 3 x 8				
	17.	VMZ30P060FMC	Screw 3 x 6				
	18.	MTZ30P100FZK	Screw 3 x 10				
	19.	VTZ30P100FZK	Screw 3 x 10				



5. PAC

Parts List

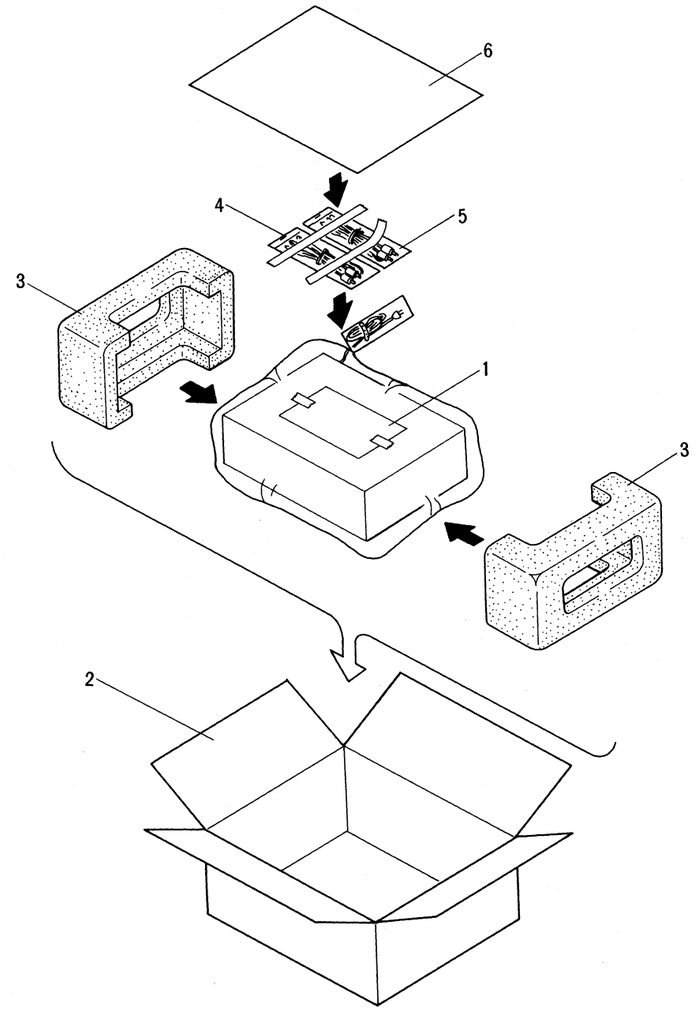
Mark	No.
	1.
	2.
	3.
	4.
	5.
	6.



5. PACKING

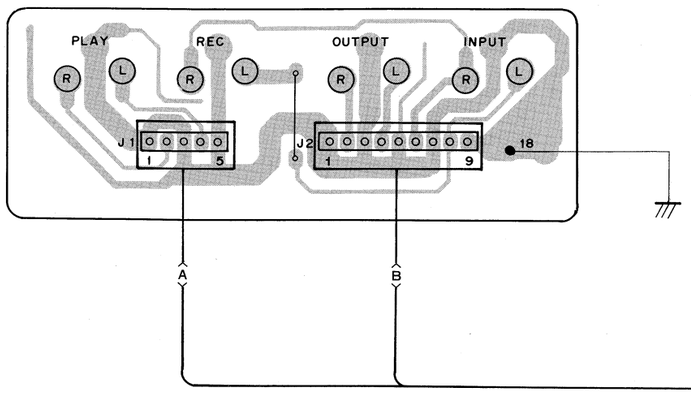
Parts List

Mark	No.	Part No.	Description
	1.	ARB-581	Operating instructions English(S, S/G types)
		ARC-064	Operating instructions Italian(S type only)
	2.	AHE-283	Packing case (S type)
		AHE-284	Packing case (S/G type)
	3.	AHA-366	Side pad
	4.	ADE-072	Connection cord (Gray)
	5.	ADE-073	Connection cord (Black)
	6.	AHB-142	Packing spacer (S/G type only)

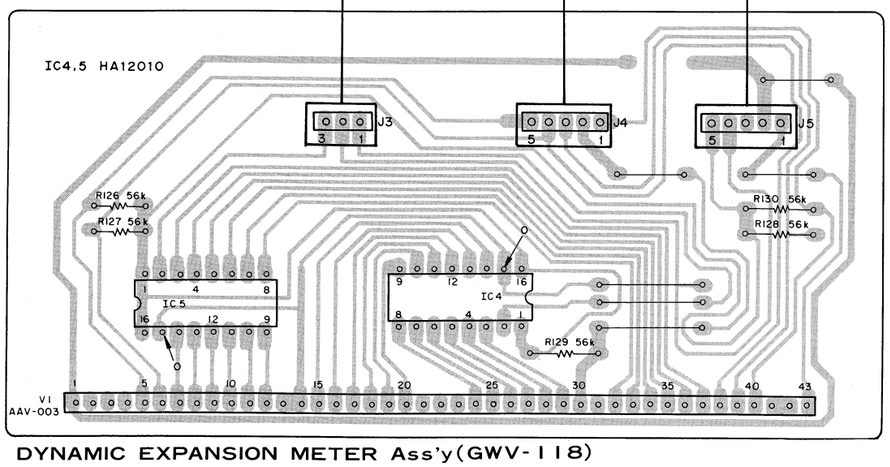


6. P.C.BOARDS CONNECTION DIAGRAM

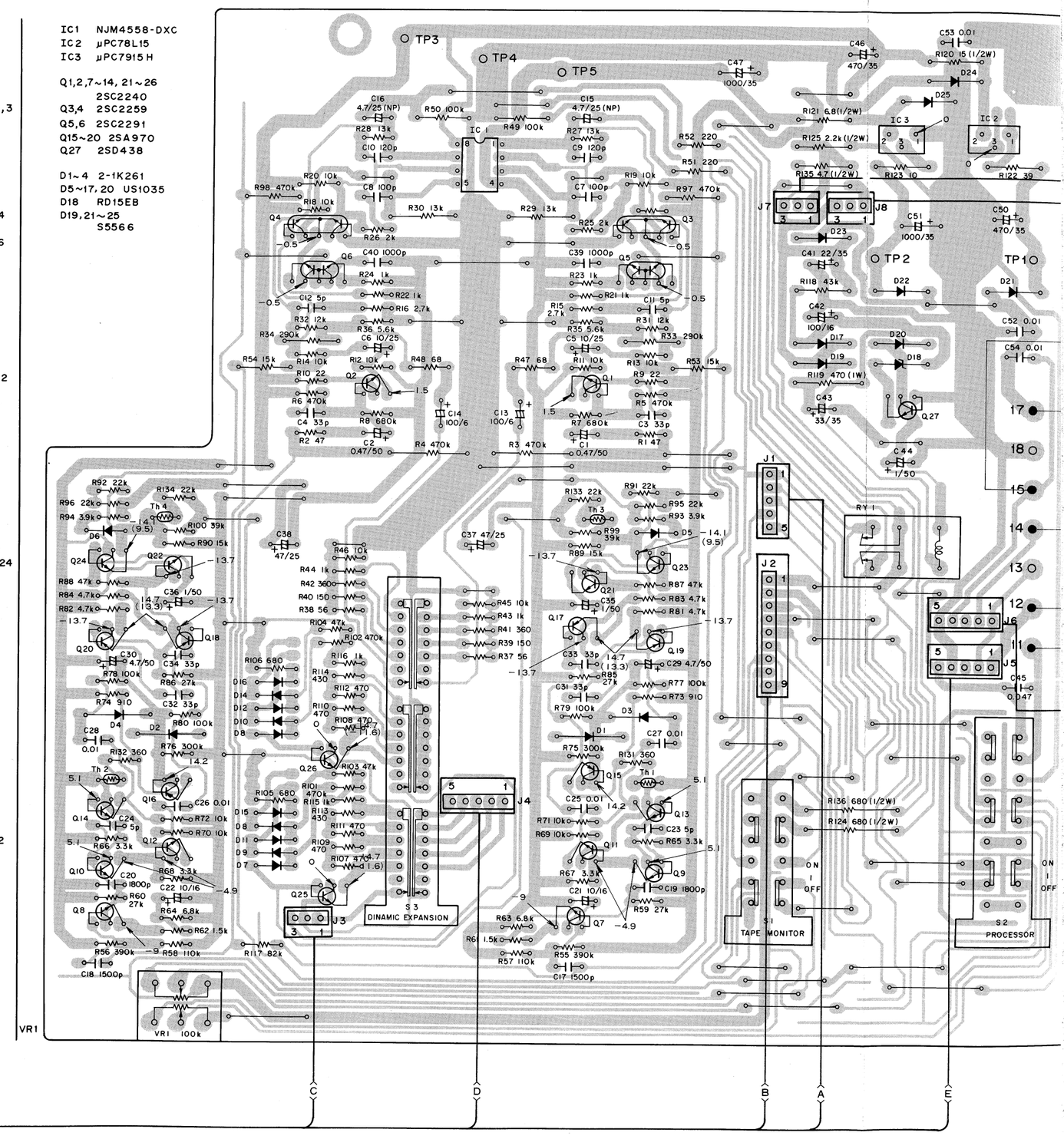
PIN JACK Ass'y(GWX-964)



DYNAMIC EXPANSION METER Ass'y(GWV-118)



PROCESSOR Ass'y(GWM-330)



PROCESSOR Ass'y (GWM-330)

IC1 NJM4558-DXC
IC2 μPC78L15
IC3 μPC7915H

Q1,2,7~14, 21~26 2SC2240
Q3,4 2SC2259
Q5,6 2SC2291
Q15~20 2SA970
Q27 2SD438

D1~4 2-1K261
D5~17, 20 US1035
D18 RD15EB
D19, 21~25 S5566

IC2,3
IC1
Q3,4
Q5,6
Q1,2
Q27
Q22
Q23,24
Q21
Q17
Q18
Q19
Q20
Q26
Q15
Q16
Q13
Q14
Q11,12
Q9
Q10
Q25
Q8
Q7

TP3 TP4 TP5 TP2 TP1

IC1 IC2 IC3

J1 J2 J3 J4 J5 J6 J7 J8

RY1

S1 TAPE MONITOR
S2 PROCESSOR
S3 DINAMIC EXPANSION
S4 POWER
S5

VR1 100k

POWER LED Ass'y
AEL-382
D27
J7

TAPE MONITOR LED Ass'y
D26
AEL-426
J8

GRN WHT YEL BRN PNK RED BLU BLK GRY PUR BLU GRN

SWITCHED 100W MAX
AKP-038

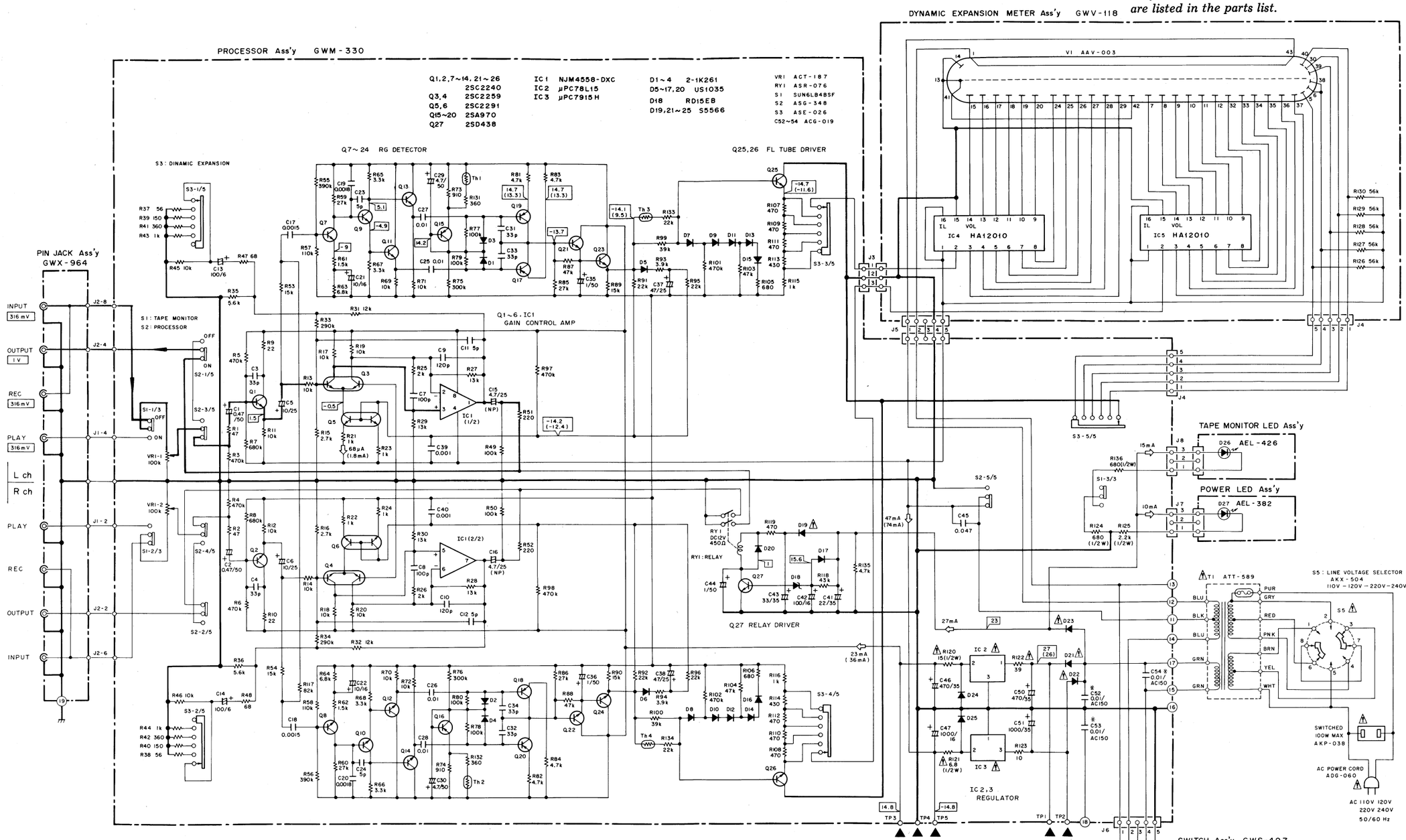
AC POWER CORD
ADG-060

AC 110V 120V
220V 240V
50/60HZ

SWITCH Ass'y
(GWS-497)

7 SCHEMATIC DIAGRAM

NOTE:
The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.



1. RESISTORS:
Indicated in Ω, ¼W, ½W, ±5% tolerance unless otherwise noted k : kΩ, M : MΩ, (F) : ±1%, (G) : ±2%, (K) : ±10% (M); ±20% tolerance

2. CAPACITORS:
Indicated in capacity (μF)/voltage (V) unless otherwise noted p : pF
Indication without voltage is 50V except electrolytic capacitor.

3. VOLTAGE, CURRENT:
: DC voltage (V) at no input signal
Value in ( ) is DC voltage at rated power.
⇦mA : DC current at no input signal

4. OTHERS:
➡ : Signal route.
The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
※ marked capacitors and resistors have parts numbers.

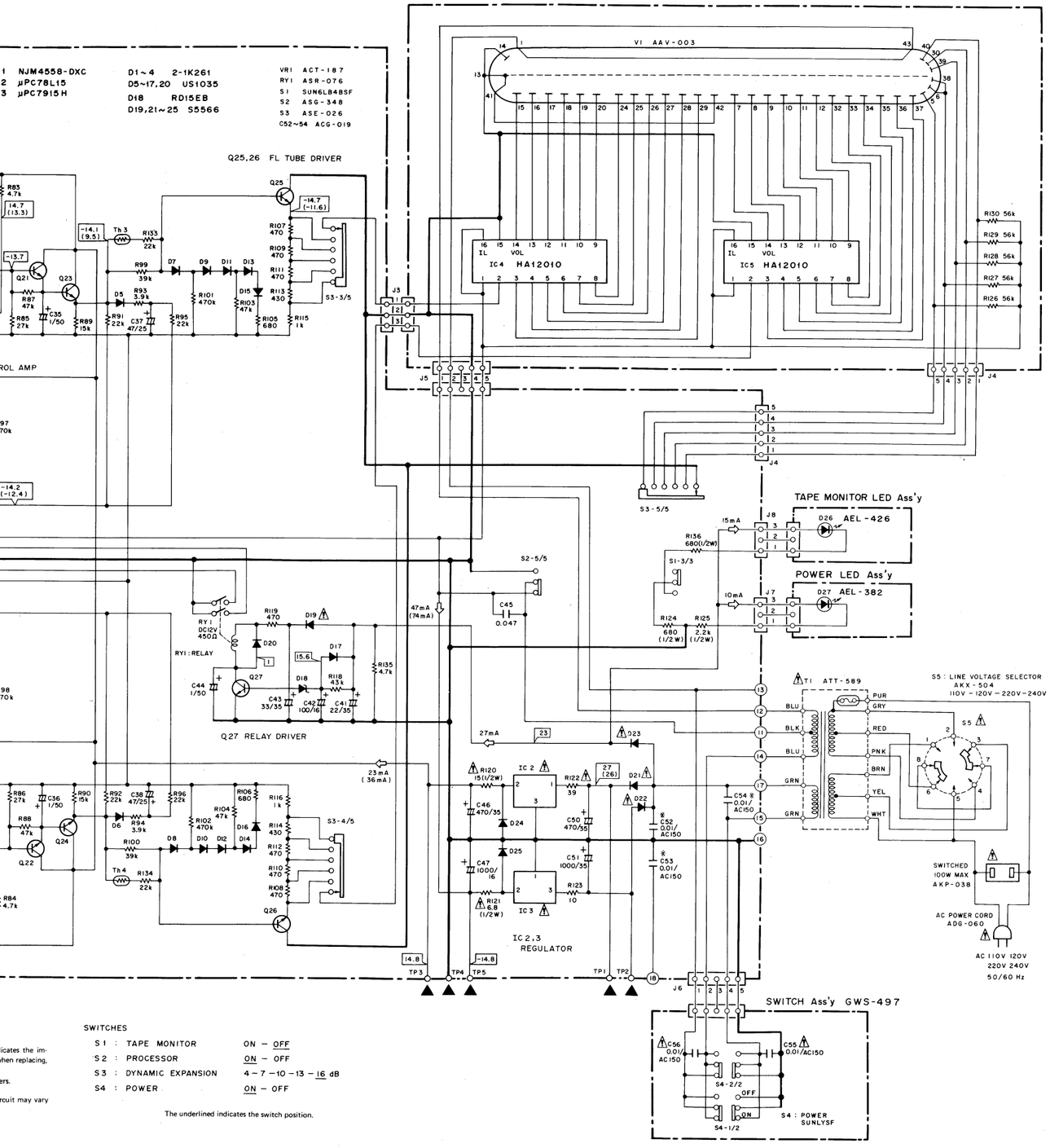
This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

SWITCHES

S1 :	TAPE MONITOR	ON − OFF
S2 :	PROCESSOR	ON − OFF
S3 :	DYNAMIC EXPANSION	4 − 7 − 10 − 13 − 16 dB
S4 :	POWER	ON − OFF

The underlined indicates the switch position.

NOTE:
The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.



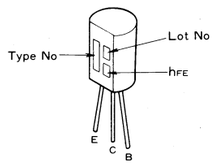
SWITCHES

S1 :	TAPE MONITOR	ON – OFF
S2 :	PROCESSOR	ON – OFF
S3 :	DYNAMIC EXPANSION	4 – 7 – 10 – 13 – 16 dB
S4 :	POWER	ON – OFF

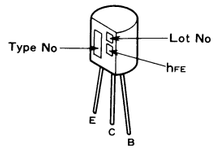
The underlined indicates the switch position.

External Appearance of Transistors and ICs

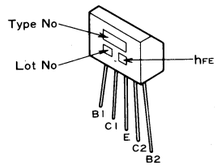
2SA992
2SC1845



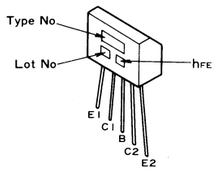
2SA970
2SC2240



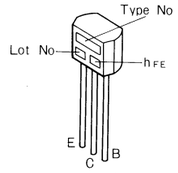
2SC2259



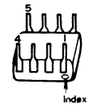
2SC2291



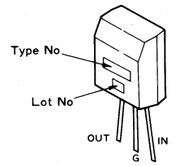
2SC2603



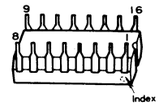
NJM4558DXC
M5218P



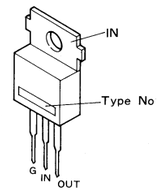
μPC78L15



HA12010



μPC7915H



8. CIRCUIT DESCRIPTIONS

8.1 RG-60 FUNCTION

The RG-60 is essentially an adaptor unit which purposely expands the dynamic range of a program source to allow enjoyment of intensified and dynamic sound reproduction. As it functions basically as a sound expander , its input to output response is not linear in comparison with a typical audio amplifier.

A noise reduction effect can also be obtained by employing the RG-60. This is due to the fact that the expansion function does not operate with respect to low input signal levels and the detector circuit does not respond to tape hiss and motor rumble.

8.2 OPERATING PRINCIPLE

The operating principle of the RG processor is shown in Fig. 8-1. A gain control amplifier (GCA) amplifies the input signal to produce output signal *eo*. The GCA is a negative feedback amplifier in which the gain varies according to the control current *Iabc*. The sensor section generates a DC current *Ia* determined by the level of a middle frequency signal input, and the sum of *Ia* and the bias current *Io* produces *Iabc*. Fig. 8-2 shows the relationship between the input signal level *ei* and the control current *Iabc*. In the absence of an input signal *ei*, *Iabc* is equal to the bias current *Io*. When *ei* is applied, *Ia* increases proportionally and *Iabc* is therefore increased. Further increase in *ei* saturates the sensor section and both *Ia* and *Iabc* reach a fixed level.

Since gain of the GCA is controlled by *Iabc*, the gain characteristic with respect to the input level is as shown in Fig. 8-3. As the GCA gain characteristic then becomes the RG processor gain characteristic, with a low input level the RG processor gain is low, while the gain increases with a high input level. The input signal *ei* is thus expended to form the output signal *eo*.

Maximum gain *Am* can be determined by varying the feedback ratio of the GCA, this is performed by adjusting the value of R4 in Fig. 8-1. Selecting an appropriate value for R5 fixes minimum gain *Ao* ($R_5 = \alpha_0 R_3$), regardless of the setting of resistance R4.

The sensor section possesses bandpass characteristics in the middle frequency range. This is to prevent GCA expansion of undersirable noise such as that produced by tape hiss and motor rumble. Since the GCA frequency response is flat, all of the input frequency are expanded, resulting in similar input and output waveforms. Thus, if the input is a squarewave, the output also becomes a squarewave.

The ratio between instantaneous gain *A* and minimum gain *Ao* is termed dynamic expansion. In other words, it refers to the degree by which the gain is increased at a high input level with respect to the fixed gain at low input level.

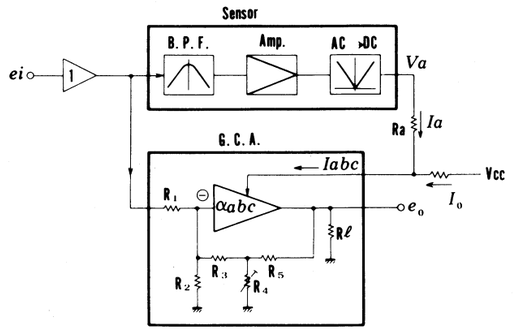


Fig. 8-1 Operating principle of the characteristics RG processor

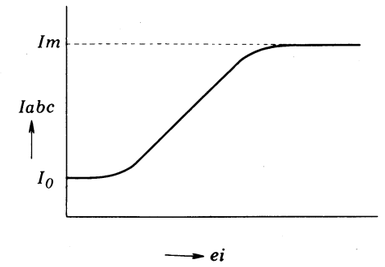


Fig. 8-2 Input-control current characteristics

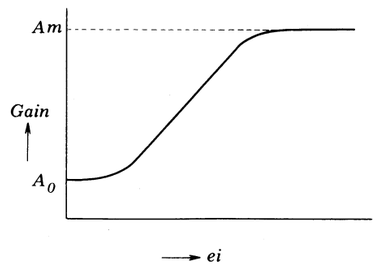


Fig. 8-3 Input-gain characteristics

8.3 INDIVIDUAL FUNCTIONS

The circuit consists mainly of a flat frequency response gain control amplifier (GCA) and a sensor section which produces the signal to control the gain of the gain control amplifier. After passing through the input level control and buffer amplifier, a portion of the input signal goes to the sensor section as shown in block diagram.

Sensor Section

B.P.F. Amplifier

—6 dB/octave high and low pass filters are inserted before and after the single transistor amplifier to form an amplifier with a peak response at 2.5kHz.

AC-DC Converter Circuit (RG Detector)

This circuit, patented by Robert Grodinsky, employs a ripple cancelling type peak detector. Since large value capacitors are not needed to reduce the ripple component during AC signal conversion, response is extremely fast with respect to input signal variations. The circuit principle is illustrated in Fig. 8-4.

Forward and reverse phase signals are obtained from the AC input signal. These pass through clamper circuits (which clamp signal peaks) and when the outputs are added, the AC component is cancelled, leaving the DC component from the clampers.

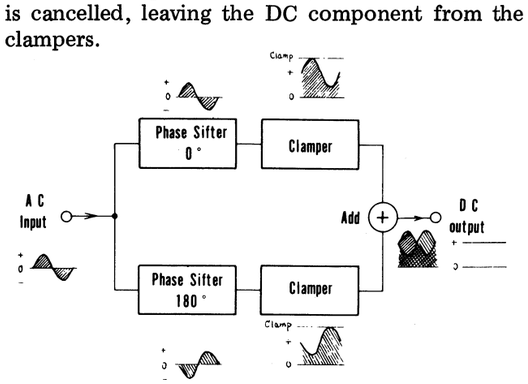


Fig. 8-4 Operating principle of the AC-DC converter

Fig. 8-6. shows the circuit used in the RG-60. Since Q_6 (Q_7) is a PNP type transistor, when the base potential falls the collector current increases and the voltage produced at R_2 becomes larger. Due to their opposite phases, the AC components of the voltage produced at R_9 by Q_6 and Q_7 collector currents are cancelled, and only the DC components are obtained.

Gain Control Amplifier (GCA)

Operation of the DYNAMIC EXPANSION switch on the front panel varies the GCA negative feedback ratio. Selection of the dynamic expansion can be performed in 3dB steps from 4dB — 16dB.

Current from the sensor section determines the open-loop gain of the gain control amplifier. The gain therefore increases as the control current increases in accordance with the input signal. The characteristics of this signal undergo changes such as those in Fig. 8-8. input-gain characteristics. To provide this characteristics, an NFB (negative feedback) circuit returns a portion of the GCA output to the input, and the dynamic expansion selector selects the NFB elements to control the feedback ratio, thereby determining the total gain.

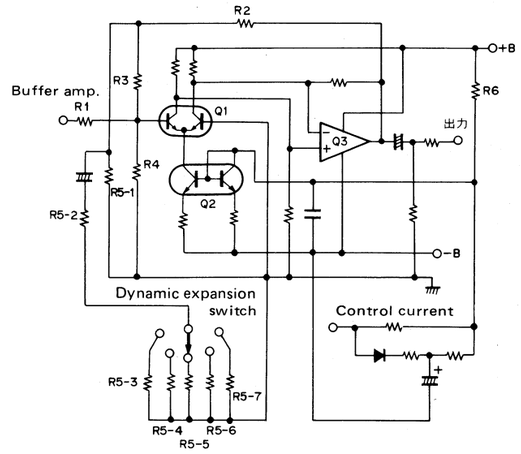


Fig. 8-5 Gain control amplifier

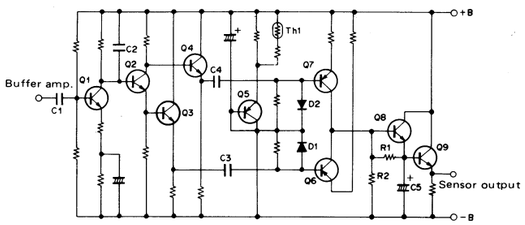


Fig. 8-6 RG detector circuit of RG-60

L-R Blend Circu

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Delay Circuit

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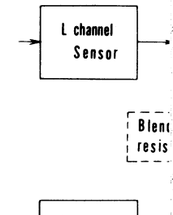

Fig. 8-7

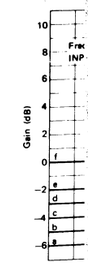

Fig. 8-8 In

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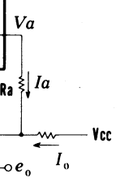

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8.3 INDIVIDUAL FUNCTIONS

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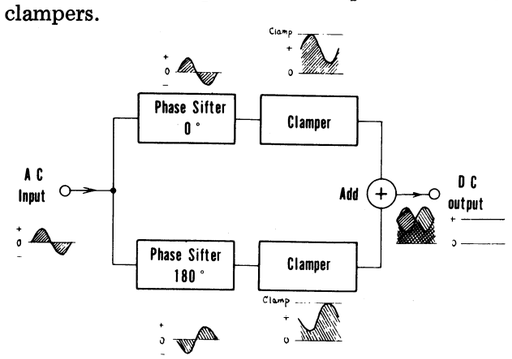

Fig. 8-4 Operating principle of the AC-DC converter

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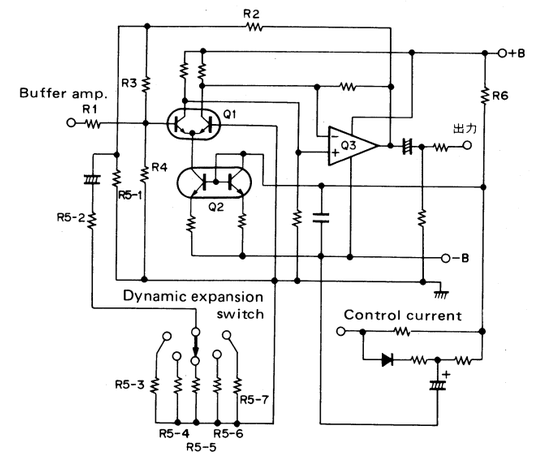


Fig. 8-5 Gain control amplifier

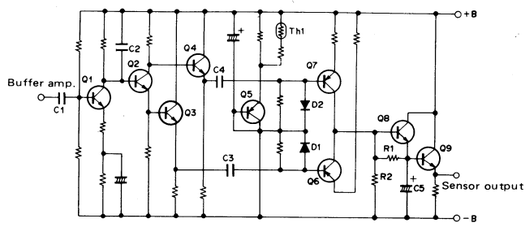


Fig. 8-6 RG detector circuit of RG-60

L-R Blend Circuit

Excessive difference between left and right channel gains would lead to unnatural sound reproduction. The left and right GCA control signals are therefore cross blended through a resistor. This holds the maximum gain difference between the two channels to about 5dB.

Delay Circuit

The AC-DC converter circuit (RG detector) responds rapidly to signal level variations. Although better results can be obtained with a faster response to signal rise time, if the fall time response is excessively fast, the output signal declines too quickly with respect to a gradual drop in input. This causes unnatural sound reproduction (resonance and reverberations become lost), and for this reason the sensor output is taken through 2 lines, one of which passes through a CR time constant circuit that delays the response speed thus overcoming the difficulty.

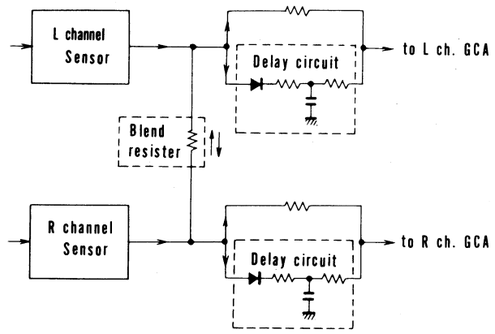


Fig. 8-7 L-R blend and delay circuit

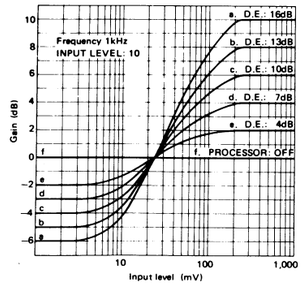


Fig. 8-8 Input-gain characteristics of RG-60

Dynamic Expansion Meter

The RG-60 dynamic expansion indicators feature fluorescent indicator tube (FL tube). In this tube, thermionic emissions from the cathode are accelerated into the fluorescent substance of the segmental anodes, resulting in the emission of light. This tube is used to indicate numerals, letters, and others symbols.

Instantaneous expansion in dB is indicated on the FL tube. Since the degree of expansion is determined by the sensor output voltage, that voltage is logarithmically compressed to drive the FL tube. An outline of the FL tube drive circuit is shown in Fig. 8-9.

To drive the FL tube, the sensor output is logarithmically compressed by R_1, R_2 and D_1 — D_3, then amplified by Q_1. S_1(DYNAMIC EXPANSION switch) selects resistors R_6 — R_{10} to determine the maximum deflection of the meter (4, 7, 10, 13 or 16dB).

The output power indicator segments of the FL tube are driven by the HA12010 ICs (one for each channel) equipped with 12 pairs of differential amplifiers. These amplifiers are biased at increasing levels, so each amplifier will commence to operate separately as the input level increases.

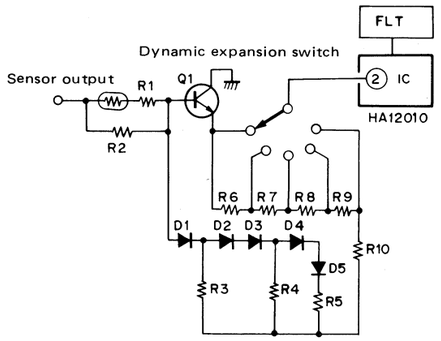


Fig. 8-9 FL tube drive circuit

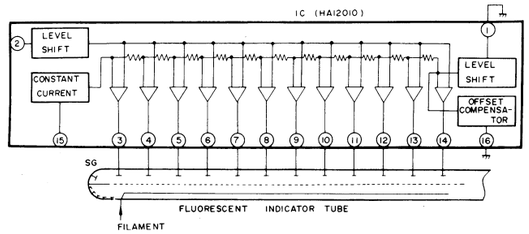
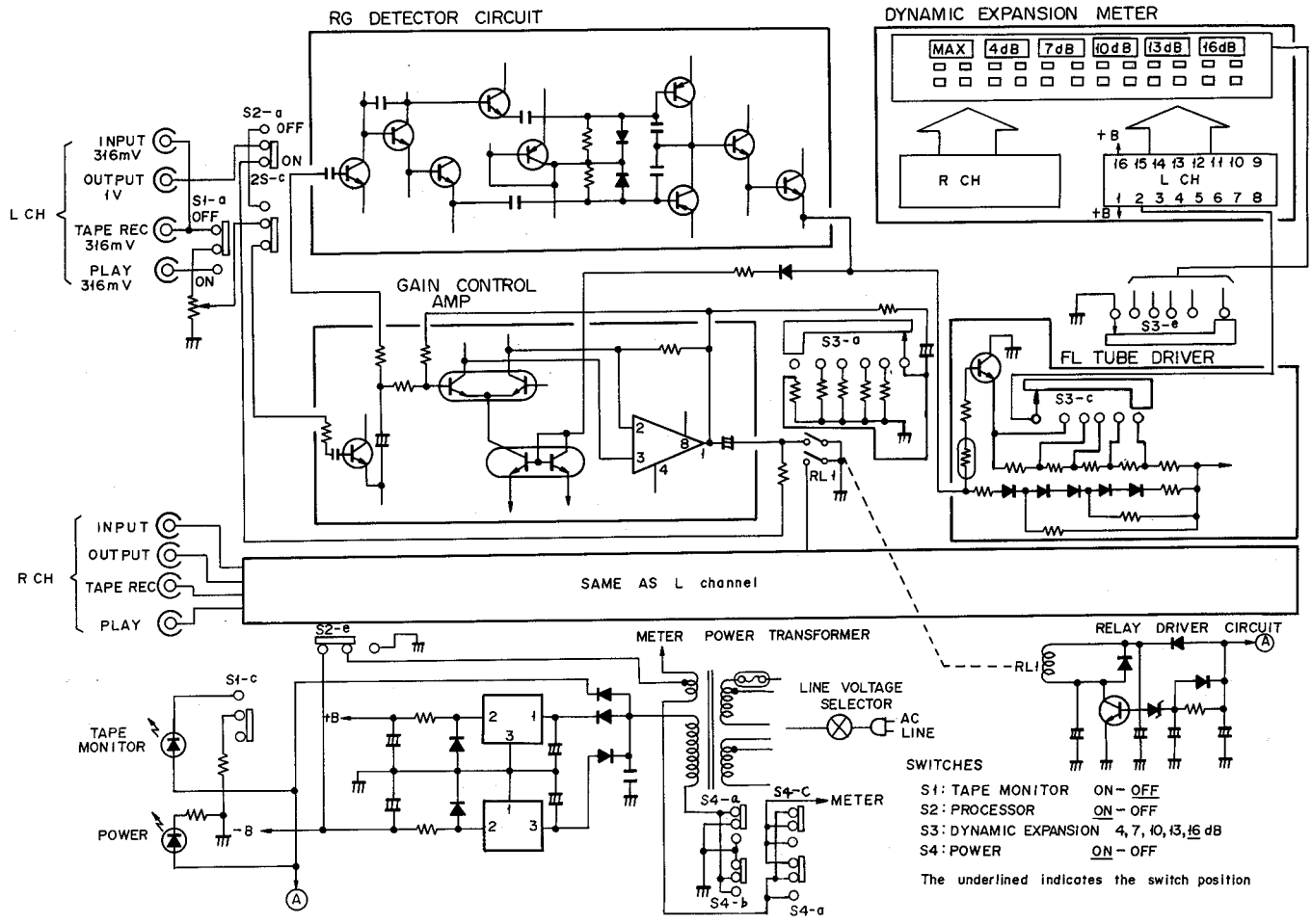


Fig. 8-10 Circuit diagram of HA12010

9. BLOCK DIAGRAM



10. ELECTRICAL PARTS LIST

NOTES:

- *When ordering resistors, first convert resistance values into code form as shown in the following examples.*
  Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J=5%, and K=10%).

560Ω	*56 × 10¹*	*561 .....*	*RD¼PS 5 6 1 J*
47kΩ	*47 × 10³*	*473 .....*	*RD¼PS 4 7 3 J*
0.5Ω	*0R5 .....*		*RN2H 0 R 5 K*
1Ω	*010 .....*		*RS1P 0 1 0 K*

  Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ	*562 × 10¹*	*5621 ....*	*RN¼SR 5 6 2 1 F*

- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★ .*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

Miscellaneous Parts

P.C. BOARD ASSEMBLIES

Mark	Part No.	Symbol & Description
	GWM-330	Processor assembly
	GWV-118	Dynamic expansion meter assembly
	GWX-964	Pin jack assembly
		Tape monitor LED assembly
		Power LED assembly
	GWS-497	Switch assembly

OTHERS

Mark	Part No.	Symbol & Description
⚠	AKP-038	AC soket (AC OUTLETS)
⚠ ★	ATT-589	Power transformer (110V, 120V, 220V, 240V)
⚠ ★★	AKX-504	Line voltage selector (S5)
⚠	ADG-060	AC power cord

Processor Assembly (GWM-330)

SEMICONDUCTORS

Mark	Part No.	Symbol & Description
★★	2SC2240 (2SC1845)	Q1, Q2, Q7 – Q14, Q21 – Q26
★★	2SA970 (2SA992)	Q15 – Q25
★★	2SD438	Q27
★★	2SC2259	Q3, Q4
★★	2SC2291	Q5, Q6
★★	NJM4558 (M5218P)	IC1
★★	μPC78L15	IC2
★★	μPC7915H	IC3
★	US1035 (1S1555)	D5 – D17, D20
★	2-1K261	D1 – D4
★	S-5566	D19, D21 – D25
★	RD15EB (HZ15EB)	D18
★	TH102-2	TH1, TH2
★	TH103-2	TH3, TH4

VOLUME SWITCH RELAY

Mark	Part No.	Symbol & Description
★★	SUN6LB4BS	S1 Push switch (TAPE MONITOR)
★★	ASG-348	S2 Push switch (PROCESSOR)
★★	ASE-026	S3 Slide rotaryswitch (EXPANSION)
★★	ASR-076	RY1 Relay (MUTING)

CAPACITORS

Mark	Part No.	Symbol & Description
	CEA010M50L	C44
	CEA4R7M50L	C29, C30
	CEA100M16L	C21, C22
	CEA220M35L	C41
	CEA330M35L	C43
	CEA101M16	C42
	CEA471M35L	C46, C50
	CEA102M35L	C47, C51
	CEANLR47M50	C1, C2
	CEANL010M50	C35, C36
	CEANL100M25	C5, C6
	CEANL470M25	C37, C38
	CEANL101M6	C13, C14
	CEANLNP4R7M25	C15, C16
	CQMA102J50	C39, C40
	CQMA152J50	C17, C18
	CQMA182J50	C19, C20
	CQMA103J50	C25 – C28
	CQSA121J50	C9, C10
	CCDSL050C50	C11, C12, C23, C24
	CCDSL101J50	C7, C8
	CCDSL330J50	C3, C4, C31 – C34
	CKDYF473Z50	C45
	ACG-019	C52 – C54 Ceramic (0.01/150V)

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Part No.	Symbol & Description
★	ACT-187	VR1 Variable (INPUT)
	RD1/2PM□□□J	R120, R124, R136, R125, R121
	RFA1/4PS100J	R123, R124
	RS1PMF471J	R119
	RN1/4PQ2940F	R33, R34
	RD1/8PM□□□J	Other resistor

Dynamic Expansion Mater Assembly (GWV-118)

Mark	Part No.	Symbol & Description
★	AAV-003	V1 Fluorescent indicator tube
★★	HA12010	IC4, IC5
	RD1/8PM563J	R126 – R130
	AEC-940	Rivet

Pin Jack Assembly (GWX-964)

Mark	Part No.	Symbol & Description
	AKB-108	4P Pin Jack

Tape Monitor LED Assembly

Mark	Part No.	Symbol & Description
★	AEC-426	D26 LED (ORN)

Power LED Assembly

Mark	Part No.	Symbol & Description
★	AEL-382	D27 (RED)

Switch Assembly (GWS-497)

Mark	Part No.	Symbol & Description
★★	SUNLYS	S4 Push switch
	ACG-019	C55, C56

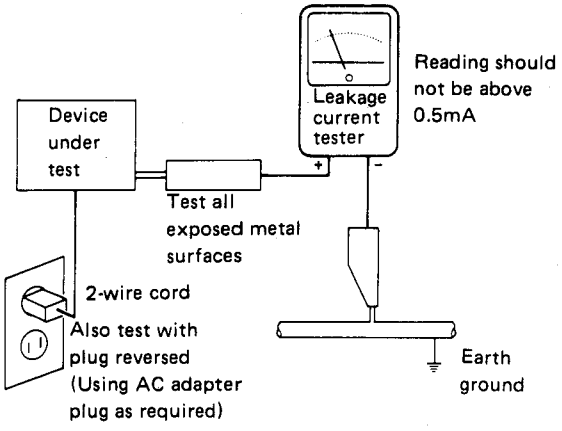
11. SAFETY INFORMATION

1. SAFETY PRECAUTIONS

The following check should be performed for the continued protection of the customer and service technician.

LEAKAGE CURRENT CHECK

Measure leakage current to a known earth ground (water pipe, conduit, etc.) by connecting a leakage current tester such as Simpson Model 229-2 or equivalent between the earth ground and all exposed metal parts of the appliance (input/output terminals, screwheads, metal overlays, control shaft, etc.). Plug the AC line cord of the appliance directly into a 120V AC 60Hz outlet and turn the AC power switch on. Any current measured must not exceed 0.5mA.


Reading should not be above 0.5mA
Leakage current tester
Device under test
Test all exposed metal surfaces
2-wire cord
Also test with plug reversed (Using AC adapter plug as required)
Earth ground

AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the appliance have special safety related characteristics. These are often not evident from visual inspection nor the protection afforded by them necessarily can be obtained by using replacement components rated for voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with a ⚠ on the schematics and on the parts list in this Service Manual.

The use of a substitute replacement component which dose not have the same safety characteristics as the PIONEER recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards.

Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current PIONEER Service Manual. A subscription to, or additional copies of, PIONEER Service Manual may be obtained at a nominal charge from PIONEER.

QUESTIONNAIRE

MODEL _____

One Model per questionnaire

Dear Servicer,

Thank you for your cooperation in the post-sale service of Pioneer products.

This questionnaire is used as a tool to improve the serviceability of our products and service manuals. Please evaluate this model and service manual by answering the following questions. Your ideas may be realized in our future products. Your answers will be appreciated. Thank you.

PIONEER ELECTRONIC CORP.

T. Nakagawa, Manager, Service Section, International Division

1. SERVICING EVALUATION	Circle applicable number:	Good		Fair		Poor
a. Disassembly/Re-assembly:		1	2	3	*4	*5
b. Circuit Checks:		1	2	3	*4	*5
c. Replacement of Parts:		1	2	3	*4	*5
d. Adjustment (s):		1	2	3	*4	*5

* If (4) or (5) was circled, please be specific.

e. Your advice, opinion or ideas related to servicing this product.

2. SERVICE MANUAL EVALUATION

a. Circuit & Mechanism Description

b. Circuit Diagram

3. OTHER

Please describe other areas of servicing which you may find difficult.

Completed by : Date :

Company Name :

Address :

City/State/Zip :

Please send this form filled to the distributor in your country.

QUESTIONNAIRE

Modèle _____
Un modèle par questionnaire

Cher Monsieur,

Merci pour votre coopération à propos du service après-vente des produits PIONEER.

Ce questionnaire a pour but l'amélioration de notre service d'entretien et des manuels de nos produits. Nous vous prions d'évaluer dans ce questionnaire les éléments de nos manuels de service. Vos conseils seront précieux et pris en considération dans la réalisation de nos produits dans l'avenir.
En vous remerciant d'avance, agréez, cher monsieur, l'expression de nos sentiments distingués.

PIONEER ELECTRONIC CORPORATION

T. Nakagawa, Manager, Service Section, Administration Department, International Division

1. ÉVALUATION EN FACILITÉ DE SERVICE MODÈLE	Cerclez le numéro. Bon,		Passable,		Mauvais,
a. Démontage/remontage	1	2	3	*4	*5
b. Examen de circuits	1	2	3	*4	*5
c. Rechange de pièces	1	2	3	*4	*5
d. Facilité de réglage	1	2	3	*4	*5

* Si vous cerclez No. 4 ou 5, donnez l'explication concrète.

e. Votre conseil ou avis sur le service

2. VOTRE APPRÉCIATION DU MANUEL DE SERVICE

a. Circuit et description du mécanisme.

b. Diagramme du circuit.

3. AUTRES

Anotez les autres points difficiles à réparer.

Répondu par : Date :

Nom : Âge :

Compagnie :

Adresse :

Adressez-vous ce questionnaire au distributeur, S.V.P.

ENCUESTA

Modelo_____

Uno modelo por encuesta

Querido señor,

Muchas gracias por su cooperación en el servicio de post-venta de los productos de Pioneer. Esto es para mejorar el servicio de post-venta de nuestros productos. Les pedimos a ustedes responder a las preguntas siguientes. Su opinión e idea estarán tenido en cuenta en los productos futuros.

Nos complacemos en saludarles muy atentamente,

PIONEER ELECTRONIC CORPORATION

T. Nakagawa, Manager, Service Section, Administration Department, International Division

1. EVALUACION EN LA FACILIDAD DE SERVICIO

MODELO

Marque uno entre los numeros siguientes.

	Bueno		Medio		Malo
a. Desmonte:	1	2	3	*4	*5
b. Examen de circuito:	1	2	3	*4	*5
c. Reemplazo de piezas:	1	2	3	*4	*5
d. Ajuste:	1	2	3	*4	*5

* Si marca (4) o (5), ejemplifiquelo concretamente.

e. Su consejo, opinión u idea en el servicio de este modelo.

2. EVALUACION DEL MANUAL DE SERVICIO

a. Circuito & Descripción de mecanismos.

b. Diagrama del circuito.

3. OTRAS

Describe otras partes dificiles de reparar.

Respondido por : **Fecha :**

Nombre : **Edad :**

Compañía :

Dirección :

Manda esta enquesta al domicilio del distribuidor, por favor.